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(DOT)**



**National Highway
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**Office of the
Associate
Administrator for
Research and
Development**

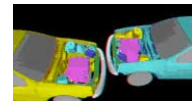
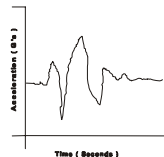
Prepared by:

**Information Systems
and Services, Inc.
(ISSI)**



NHTSA Test Reference Guide Version 5

Volume III : Component Tests



FINAL — May 2001

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Preface

This guide and its companion guides are to be used to create formatted submissions of data collected from automotive crash tests.

There are four guides:

Volume I: NHTSA Vehicle Test Reference Guide

Volume II: NHTSA Biomechanical Test Reference Guide

Volume III: NHTSA Component Test Reference Guide

Volume IV: NHTSA Signal Waveform Generator Test Reference Guide

You are reading Volume III, the NHTSA Component Test Reference Guide.

The first step in creating a data submission is to determine which database to use for your test data. The design and partitioning of each database is centered upon the focus of the testing. Test programs focused on the evaluation of the **occupant** should be submitted to the Biomechanical Database; tests focused on the evaluation of **vehicles** belong in either the Vehicle Database or the Component Database; and tests focused on the evaluation of the **data acquisition system** belong in the Signal Waveform Generator Database. Refer to the flow chart in **Figure 0-1 Database selection**, on the next page, to determine which database is appropriate for your test.

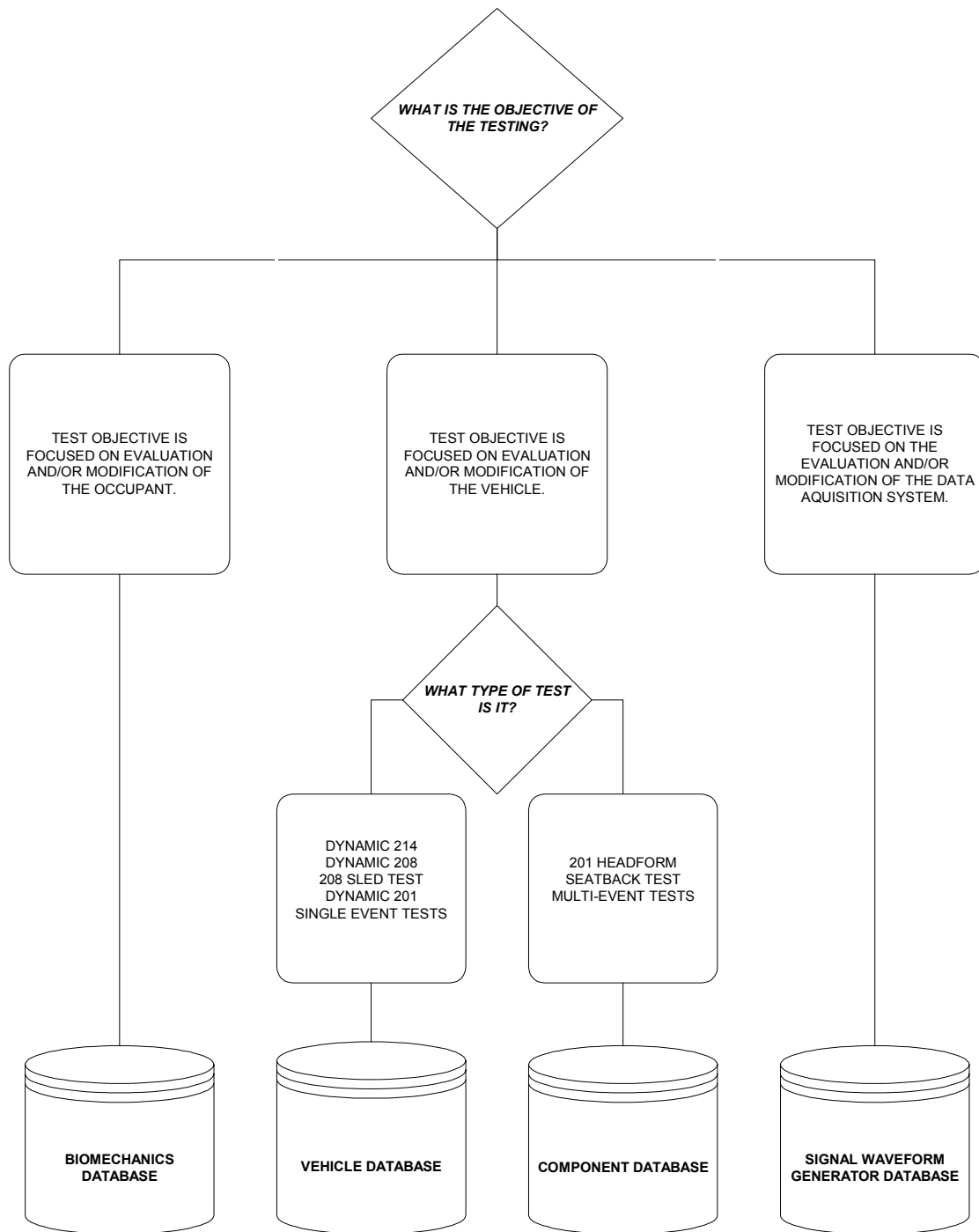


Figure 0-1 Database selection

Several examples may help to illustrate where certain types of tests fit into the databases:

- All regulatory tests shall be submitted to the Vehicle Database or Component Database.
- Tests that are performed as part of the new car assessment program shall be submitted to the Vehicle Database.
- Pendulum tests to cadavers shall be submitted to the Biomechanical Database.
- Lateral vehicle-to-vehicle impacts shall be submitted to the Vehicle Database.
- Sled tests with new dummy designs shall be submitted to the Biomechanical Database.
- Tests featuring a car body on a sled designed to evaluate occupant response should be submitted to the Biomechanical Database.
- Tests featuring a car body on a sled designed to evaluate vehicle response should be submitted to the Vehicle Database.
- Tests to record a standard waveform using new car assessment conditioning amplifiers shall be submitted to the Signal Waveform Generator Database.

In many research cases, it will be difficult to determine whether testing is focused on evaluation of the vehicle or evaluation of the occupant. Always check with the COTR in determining which database tests should be submitted. In all cases where the COTR's advice is contrary to this guide, send email to barbara.hennessey@nhtsa.dot.gov.

Release Notes

This section details changes between the current version of this guide, dated as of March 23, 2001, and the most recent version preceding this guide.

Content

- The four Test Reference Guides have been substantially merged to consolidate common information into a more easily maintained format. However, they are still distributed separately at this time.
- All guides updated to represent the version 5 schema and coding.
- A flowchart has been incorporated to assist guide users in creating a proper EV5 specification data file.
- New sections added to address video, photos, and contractor reports.
- X-Y measurement / channel data is now permitted when the independent coordinate of a measurement is non-uniformly incremental (non-constant delta between adjacent X values).
- Data coordinate systems information moved to a common appendix in **Appendix A: Data Coordinate System** so as to isolate it for easier reading and maintenance.
- New technical support appendix added in **Appendix C: Technical Support Information**.
- Updated information on Entrée for Windows version 5.

Codes

- Codes for the Component Test Reference Guide are now only available through the NHTSA Research and Development web site and the Entrée for Windows software.

Introduction

Background

In September of 1966, the National Traffic and Motor Vehicle Safety Act (15 U.S.C. 1381) was signed into law in the United States. The Act specifies that the Secretary of Transportation shall establish appropriate Federal Motor Vehicle Safety Standards that would lead to the reduction of the number of deaths and injuries resulting from motor vehicle accidents. In prescribing standards, the Secretary was to consider: (1) relevant motor vehicle safety data, (2) whether the proposed standard is reasonable, practical, and appropriate for the particular type of motor vehicle equipment for which it is prescribed, and (3) the extent to which such standards contribute to carrying out the purposes of the Act.

In order to meet the above requirements, the National Highway Traffic Safety Administration (NHTSA) has been mandated to develop safety standards. For each proposed regulation, an extensive research program is undertaken to ensure that the proposed standard satisfies the requirements of the Act. For each test conducted for the agency, data is recorded from various transducers mounted to the test dummies or vehicles, high-speed films or videos are recorded to document the event, still pictures of the test setup are taken, and a written report is generated. Since 1978, these data have been loaded into a single data repository, where NHTSA staff and the public can access the data and conduct analysis.

This reference guide has been written for two reasons. The first is to document the format and content requirements for submission of data, film, video, and reports to the NHTSA database. The second is to encourage the adoption of this standardized format so that the exchange of data by the safety research community is readily accomplished and ultimately leads to new and better ways for reducing the fatalities and injuries in motor vehicle accidents.

Data Organization

Four types of crash test data can be submitted to the NHTSA Component Test database:

- **Electronic Data** (Chapter 2) - General quantitative information about the test setup and results as well as transducer output time-history data.
- **Written Report** (Chapter 3) - A report containing information about the test, such as test setup diagrams and test anomalies. The written report should be submitted in digital form using the Adobe PDF format. Alternatively, a paper copy of the report is acceptable.
- **Pre/Post-Event Images** (Chapter 4) - Pre- or post- event images of the test environment. These may be in the form of film or digital video, time sequenced or still images.
- **Event Images** (Chapter 5) - Film, video, or still images captured during the impact event. The images may be submitted on processed prints from photo-reactive film or on CCD cameras.

Chapters 2 through 5 of this guide provide instructions for formatting of each of the above data types.

Digital Media Formats

The digital crash test information should be submitted to NHTSA on a CD-ROM, ZIP disk, or 3.5" floppy disk. Multiple tests may be submitted on a single CD-ROM. Multiple CD-ROM's or disks may be submitted for each test. Please see ***Chapter 1 – Media Formats and Layout*** for details on acceptable media and the layout of directories and files on the media.

Other Media Formats

Other media, including high-speed films, VHS or BETA videotapes, paper reports, or X-Rays should be submitted along with the digital media. If you have data that you wish to submit but which is not specified in this guide, please send email to

nrd.softdev@nhtsa.dot.gov

or contact the NHTSA COTR responsible for your submission.

Return Policy

Submissions that cannot be processed, or which have too many errors as identified by Entrée for Windows or the loading and checkout programs, will be returned to the contractor to be corrected and resubmitted.

Chapter 1 : Media Format and Layout

Each submission consists of multiple types of data: descriptive test specification data defined later in this guide, measurement data digitized from the test instrumentation signal traces, a written report of the testing, and still images and video before, during, and after the test event. Several pieces of physical media may be necessary to record all of this information for submission.

1.1 Media Types and Layout

All submissions should be written to either 3.5" 1.44 MB DOS (FAT) formatted diskettes, Iomega ZIP 100MB or ZIP 250MB cartridges, or to ISO-9660 CD-ROM with optional Joliet extensions for long file name support.

Each CD-ROM or disk should have a directory structure in accordance with the following:

- 1) **Parent directory name** - All data for each test submitted on a CD/Disk should be in a directory created in

\<TSTREF>\

where <TSTREF> is the value from the field TSTREF in Chapter 2 of this guide. So, if TSTREF = 'IMPACT123', then the directory for all data for this test shall be stored in the directory, \IMPACT123\. Users should avoid illegal filename characters ('\\', '*', '?') when choosing a value for TSTREF, so as not to interfere with the directory naming convention. Each piece of media should have a printout listing each TSTREF on the media.

- 2) **Electronic Data** - In accordance with the format in Chapter's 1 and 2, the EV5 specification file and associated transducer signal files shall be stored in the subdirectory

\<TSTREF>\DATA

- 3) **Written Report** - In accordance with Chapter 3, digital reports in PDF format shall be stored in the subdirectory

\<TSTREF>\REPORT

- 4) **Pre/Post-Event Images** – In accordance with Chapter 4, still images and video captured before and after the impact event shall be stored in the subdirectory

\<TSTREF>\PREPOST

- 5) **Event Images** - In accordance with Chapter 5, still images and video of the impact event, including high speed video files, shall be stored in the subdirectory

\<TSTREF>\EVENT

1.2 Data Entry Software

1.2-1 Entrée for Windows

NHTSA has developed the Entree for Windows data entry program in order to facilitate preparation of the specification data defined in *Chapter 2 : Field Specifications and Formats*. Because the program contains built-in data validation, it is highly recommended that specification data be generated using the Entree for Windows program.

In addition to producing new data sets, Entrée for Windows can import ASCII data sets generated by previous versions of Entree, typically of type EV4, EV5, or GR*. Once these files have been imported they can be written to a new data set in the EV5 format.

1.2.1.1 Requirements for Entrée for Windows:

Entree for Windows is a Windows-based application for the Microsoft Windows 95, Windows 98 and Windows NT environments with the following operating requirements:

- Microsoft Windows 95 / 98, Windows NT Workstation 4.0 with Service Pack 6a or later.
- Hardware (CPU, memory, and disk space) according to Microsoft recommendations.
- 24 MB of disk space to install, and 12 MB of disk space during normal use.
- SVGA display adapter with 1024x768 resolution, preferably using font size “small.”
- 3.5" 1.44 MB diskette drive, Iomega ZIP 100MB or 250 MB drive, or a CD-R / CD-RW drive capable of creating ISO-9660 CD-ROMs.

While Entrée may run under Microsoft Windows Millennium or Windows 2000, it has not been tested in those environments.

1.2-2 Customer Developed Software

NHTSA provides access to the source code for the Entrée for Windows program as a separately downloadable package on the Entrée web site (See: ***Appendix C-1 Reference Guide Updates and Software Updates***.) This source code package may be used as an educational resource in understanding how the Entrée application works, and the logic used in generating an EV5 data set. However, the source code is not suitable for direct inclusion in customer-developed software.

NHTSA does not provide source code for customers to develop their own software to write data compatible with the EV5 specification. This guide and data sets produced by the Entrée for Windows software may be used to engineer data sets that are conditionally compatible with the specification

Chapter 2 : Field Specifications and Formats

Introductory Information

As a primer to understanding the following sections please review the following information and glossary of terms. We have categorized the data types in the EV5 specification so as to make it easier to model the data and the business logic necessary for validating the data.

Glossary of Field Types:

- **Free Text** – A textual string whose content is not strictly governed by a rule, containing uppercase alphanumeric characters, white-space, and a limited set of special characters including [] () , : - + and _ . A field of this type may have a maximum length.
- **Coded Value** – A textual string whose content is limited to a predefined set of enumerated values. A field of this type will have a set length and a fixed set of possible valid values that may be assigned to the field.
- **Integer** – An unbounded integer (whole number) value having no minimum or maximum limitations on value, expressed as one optional sign character (- or +) and one or more numeric characters, or digits, in the range from 0 – 9. The absence of a sign character implies a positive value.
- **Bounded Integer** – A specific class of Integer whose content is limited by an upper and lower bound. The representation of a Bounded Integer as a textual string may be limited in length.
- **Real** – An unbounded real (floating point or decimal) value having no minimum or maximum limitations on value, expressed as one sign character (- or +), one or more numeric characters, or digits, in the range from 0 – 9, a decimal point ‘.’, and one or more numeric characters in the range from 0 – 9. The absence of a sign character implies a positive value.

The representation of a Real as a textual string may be governed by a rule that specifies a total field width, placement of the sign and decimal, and relative sizes and format of the mantissa and exponent. Any alphabetic characters in the textual representation of a Real are in uppercase.

- **Bounded Real** – A specific class of Real whose content is limited by an upper and lower bound.
- **Date** – A textual string whose content represents a calendar date of the format ‘DD/MMM/CCYY’. The maximum length of a Date is limited to 11 characters.

The ‘DD’ portion of the date is the numeric day of the month, padded to a width of two (2) characters with a leading zero, in the range from 1 – 31.

The 'MMM' portion of the date is the three-character uppercase alphabetic abbreviation of the month (e.g. 'JAN', 'FEB', 'MAR', 'APR', 'MAY', 'JUN', 'JUL', 'AUG', 'SEP', 'OCT', 'NOV', 'DEC').

The 'CCYY' portion of the date is a four-digit year with the century represented in the 'CC' position and the year within the century represented as a zero padded value in the 'YY' position (e.g. '2001' would be century 20 AD, and year 01 within the century).

2.1 Electronic Data

2.1-1 Specification Data

The ASCII file for a specific test consists of groups of records from each of the categories listed below:

RECORD TYPE	GROUP
TEST	1
VEHICLE	2
COMPONENT	3
CONFIGURATION	4
INSTRUMENTATION	5

Table 2-1 EV5 specification data groups

For example, a Component test might consist of specification records for TEST, VEHICLE, COMPONENT, CONFIGURATION, and INSTRUMENTATION.

The flowchart in **Figure 2-1**, below, should be used to determine what record types to include in the specification data file.

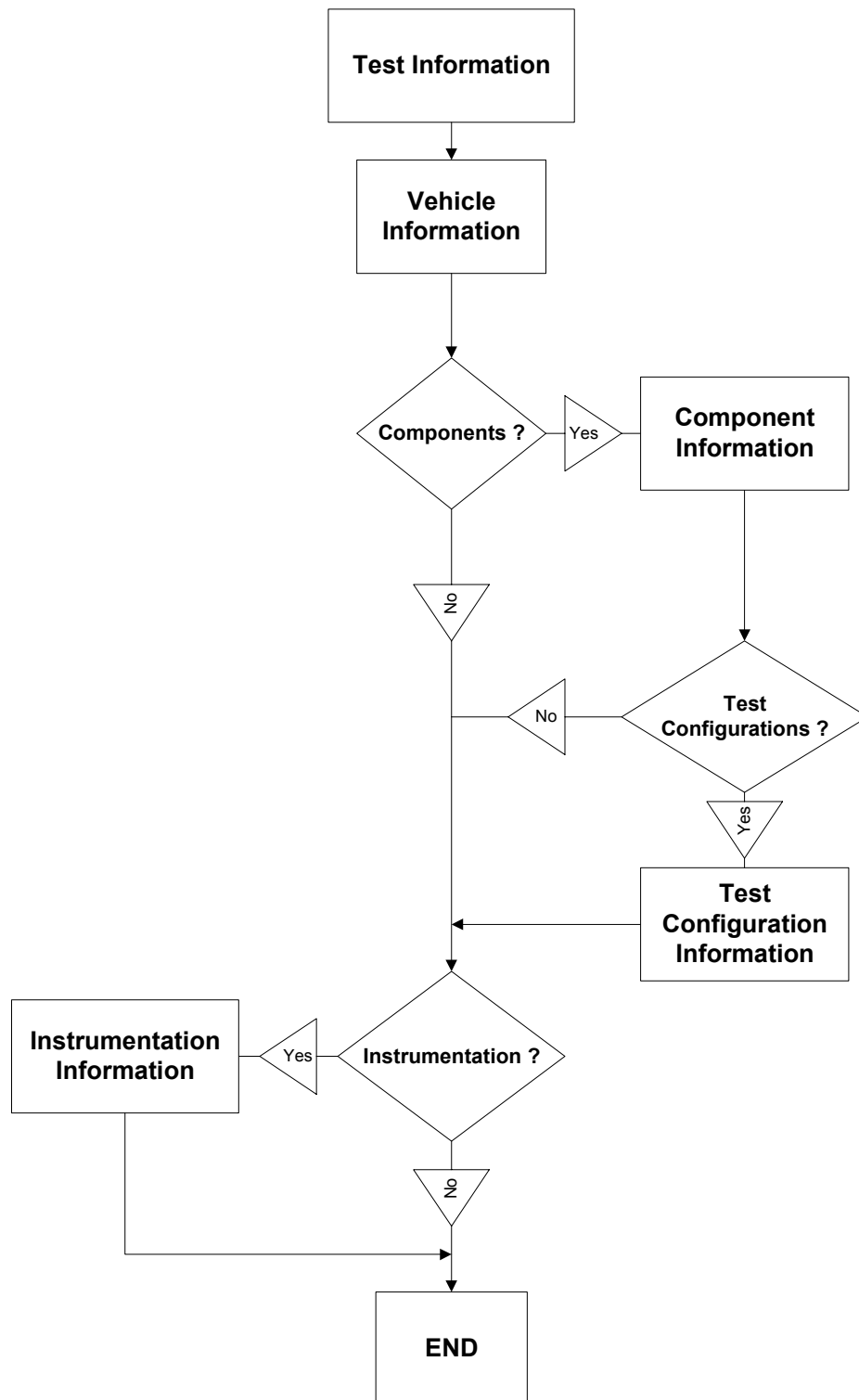


Figure 2-1 EV5 Component Specification Data Flowchart

2.1.1.1 Record Layout for ASCII Specification File

The fields and their positions in each of the specification data records are listed in the sections following this one, starting with **Section 2.2 General Test Information**. The first line of the ASCII (.EV5) specification file should be the string

“----- EV5 -----”

or

“-----”+space+ “EV5”+space+ “-----”

The specification file should terminate with the line

“----- END -----”

Within the body of the specification file each section should begin with a “key” line indicating the record type for the data group following the key. These keys have the form

“----- KEY -----”

or

“-----”+space+ “KEY”+space+ “-----”

where KEY is appropriate to a particular record type as listed in **Table 2-1 EV5 specification data groups**. (e.g. KEY = TEST or KEY = OCCUPANT, etc.)

Fields within a record are delimited by the pipe character (|), records are delimited by a line feed.

Fields for which no information is available should contain one blank character. In other words, an empty field begins after the pipe delimiter of the previous field, and consists of a single blank followed by another pipe delimiter.

All text should be uppercase.

Comments within the specification file are allowable anywhere in the file, but must start on a new line with the # (pound) sign and end with a line feed.

2.1.1.2 Specification Data Example: Component

Please note that while the records in this example appear to span lines, in actuality they are continuous and have been wrapped to fit this page.

Source: Entree for Windows v5

Date: <12/5/2000>

----- EV5 -----

----- TEST -----

C5|FMVSS201U OCCUPANT PROTECTION IN INTERIOR IMPACT|UPPER INTERIOR HEAD IMPACT PROTECTION|24/JUL/2000|CAL|DTNH22-99-C-01005|CY0503FMH|201|23|40|2000 BMW 328I 4-DR SEDAN CY0503

----- VEHICLE -----

1|27|99|2000|CY0503|4D|WBAAM5340YFR17241|N|2000 BMW 328I 4-DR SEDAN CY0503

2| | |2000| | | |

----- COMPONENT -----

1|1|PLRR|VE|0|N| |P5|50|APPLIED SAFETY|RP2

1|2|HDDR|VE|0|N| |P5|50|FIRST TECHNOLOGIES|SR3 - RIGHT

1|3|RFIN|VE|0|N| |P5|50|FIRST TECHNOLOGIES|UR2-B

1|4|HDRF|VE|0|N| |P5|50|APPLIED SAFETY|SR2A - RIGHT

1|5|PLBR|VE|0|N| |P5|50|FIRST TECHNOLOGIES|BP3 - RIGHT

1|6|PLBL|VE|0|N| |P5|50|FIRST TECHNOLOGIES|BP2 - LEFT

1|7|PLAL|VE|0|N| |P5|50|APPLIED SAFETY|AP1 - LEFT

1|8|RFIN|VE|0|N| |P5|50|FIRST TECHNOLOGIES|UR1B - LEFT

1|9|HDLR|VE|0|N| |P5|50|FIRST TECHNOLOGIES|RH - LEFT

1|10|HDLF|VE|0|N| |P5|50|APPLIED SAFETY|FH2 - LEFT

----- CONFIGURATION -----

1|1|1|LIN|0| |HDG|23.58|0|0|0|RP2|H 37; V 25

1|2|1|LIN|0| |HDG|18.50|0|0|0|SR3 - RIGHT|H 90; V 17

1|3|1|LIN|0| |HDG|23.30|0|0|0|UR2-B|H 90; V 50

1|4|1|LIN|0| |HDG|23.40|0|0|0|SR2A - RIGHT|H 90; V 32

1|5|1|LIN|0| |HDG|23.30|0|0|0|BP3 - RIGHT|H 81; V 1

1|6|1|LIN|0| |HDG|23.70|0|0|0|BP2 - LEFT|H 270; V 12

1|7|1|LIN|0| |HDG|18.90|0|0|0|AP1 - LEFT|H 260; V 29

1|8|1|LIN|0| |HDG|23.36|0|0|0|UR1B - LEFT|H 270; V 50

1|9|1|LIN|0| |HDG|23.50|0|0|0|RH - LEFT|H 360; V 50

1|10|1|LIN|0| |HDG|23.67|0|0|0|FH2 - LEFT|H 180; V 50

----- INSTRUMENTATION -----

1|1|1|1|TB|OTHR|NA|SEC|SEC|99999|KAYSER-THREDE|24/JUL/2000|999999|999|23.58|-2000|1999|50|AM|P|TIME CHANNEL

1|1|1|2|AC|HDCG|XG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|501|126|23.58|-2000|1999|50|AM|P|HEAD X ACCELERATION

1|1|1|3|AC|HDCG|YG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|497|16|23.58|-2000|1999|50|AM|P|HEAD Y ACCELERATION

1|1|1|4|AC|HDCG|ZG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|498|49|23.58|-2000|1999|50|AM|P|HEAD Z ACCELERATION

1|2|1|5|TB|OTHR|NA|SEC|SEC|99999|KAYSER-THREDE|24/JUL/2000|999999|999|18.50|-2000|1999|50|AM|P|TIME CHANNEL

1|2|1|6|AC|HDCG|XG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|496|91|18.50|-2000|1999|50|AM|P|HEAD X ACCELERATION

1|2|1|7|AC|HDCG|YG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|501|12|18.50|-2000|1999|50|AM|P|HEAD Y ACCELERATION

1|2|1|8|AC|HDCG|ZG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|494|27|18.50|-2000|1999|50|AM|P|HEAD Z ACCELERATION

1|3|1|9|TB|OTHR|NA|SEC|SEC|99999|KAYSER-THREDE|24/JUL/2000|999999|999|23.30|-2000|1999|50|AM|P|TIME CHANNEL

1|3|1|10|AC|HDCG|XG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|499|81|23.30|-2000|1999|50|AM|P|HEAD X ACCELERATION

1|3|1|11|AC|HDCG|YG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|499|3|23.30|-2000|1999|50|AM|P|HEAD Y ACCELERATION

1|3|1|12|AC|HDCG|ZG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|498|24|23.30|-2000|1999|50|AM|P|HEAD Z ACCELERATION

1|4|1|13|TB|OTHR|NA|SEC|SEC|99999|KAYSER-THREDE|24/JUL/2000|999999|999|23.40|-2000|1999|50|AM|P|TIME CHANNEL

1|4|1|14|AC|HDCG|XG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|501|175|23.40|-2000|1999|50|AM|P|HEAD X ACCELERATION
1|4|1|15|AC|HDCG|YG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|497|5|23.40|-2000|1999|50|AM|P|HEAD Y ACCELERATION
1|4|1|16|AC|HDCG|ZG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|498|50|23.40|-2000|1999|50|AM|P|HEAD Z ACCELERATION
1|5|1|17|TB|OTHR|NA|SEC|SEC|99999|KAYSER-THREDE|24/JUL/2000|999999|999|23.30|-2000|1999|50|AM|P|TIME CHANNEL
1|5|1|18|AC|HDCG|XG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|496|123|23.30|-2000|1999|50|AM|P|HEAD X ACCELERATION
1|5|1|19|AC|HDCG|YG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|501|17|23.30|-2000|1999|50|AM|P|HEAD Y ACCELERATION
1|5|1|20|AC|HDCG|ZG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|494|47|23.30|-2000|1999|50|AM|P|HEAD Z ACCELERATION
1|6|1|21|TB|OTHR|NA|SEC|SEC|99999|KAYSER-THREDE|24/JUL/2000|999999|999|23.70|-2000|1999|50|AM|P|TIME CHANNEL
1|6|1|22|AC|HDCG|XG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|496|241|23.70|-2000|1999|50|AM|P|HEAD X ACCELERATION
1|6|1|23|AC|HDCG|YG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|501|80|23.70|-2000|1999|50|AM|P|HEAD Y ACCELERATION
1|6|1|24|AC|HDCG|ZG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|494|140|23.70|-2000|1999|50|AM|P|HEAD Z ACCELERATION
1|7|1|25|TB|OTHR|NA|SEC|SEC|99999|KAYSER-THREDE|24/JUL/2000|999999|999|18.90|-2000|1999|50|AM|P|TIME CHANNEL
1|7|1|26|AC|HDCG|XG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|501|148|18.90|-2000|1999|50|AM|P|HEAD X ACCELERATION
1|7|1|27|AC|HDCG|YG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|497|12|18.90|-2000|1999|50|AM|P|HEAD Y ACCELERATION
1|7|1|28|AC|HDCG|ZG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|498|34|18.90|-2000|1999|50|AM|P|HEAD Z ACCELERATION
1|8|1|29|TB|OTHR|NA|SEC|SEC|99999|KAYSER-THREDE|24/JUL/2000|999999|999|23.36|-2000|1999|50|AM|P|TIME CHANNEL
1|8|1|30|AC|HDCG|XG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|499|66|23.36|-2000|1999|50|AM|P|HEAD X ACCELERATION
1|8|1|31|AC|HDCG|YG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|499|7|23.36|-2000|1999|50|AM|P|HEAD Y ACCELERATION
1|8|1|32|AC|HDCG|ZG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|498|41|23.36|-2000|1999|50|AM|P|HEAD Z ACCELERATION
1|9|1|33|TB|OTHR|NA|SEC|SEC|99999|KAYSER-THREDE|24/JUL/2000|999999|999|23.50|-2000|1999|50|AM|P|TIME CHANNEL
1|9|1|34|AC|HDCG|XG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|496|113|23.50|-2000|1999|50|AM|P|HEAD X ACCELERATION
1|9|1|35|AC|HDCG|YG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|501|18|23.50|-2000|1999|50|AM|P|HEAD Y ACCELERATION
1|9|1|36|AC|HDCG|ZG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|494|44|23.50|-2000|1999|50|AM|P|HEAD Z ACCELERATION
1|10|1|37|TB|OTHR|NA|SEC|SEC|99999|KAYSER-THREDE|24/JUL/2000|999999|999|23.67|-2000|1999|50|AM|P|TIME CHANNEL
1|10|1|38|AC|HDCG|XG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|501|84|23.67|-2000|1999|50|AM|P|HEAD X ACCELERATION
1|10|1|39|AC|HDCG|YG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|497|5|23.67|-2000|1999|50|AM|P|HEAD Y ACCELERATION
1|10|1|40|AC|HDCG|ZG|SEC|G'S|4000|ENDEVCO|01/MAR/2000|498|34|23.67|-2000|1999|50|AM|P|HEAD Z ACCELERATION
----- END -----

2.1-2 Signal Data

Each subsequent file after the specification data file contains unfiltered, digitized measurement data collected from the sensors used in the tests. The order of the measurement files corresponds to the order of the instrumentation records in the instrumentation group specification records. The measurement files are made up of ASCII records of 1 data point each, delimited by a line feed character (ASCII decimal 10, hexadecimal \x0a, octal \012). If X-Y data - measurement data in which the independent X coordinate is non-uniformly incremental - is supplied then each record consists of 1 data point each with the X coordinate listed first, followed by a single tab character, followed by the associated Y coordinate, and ending with a line feed character.

The point specification will allow for any floating-point format, but the preferred format is the C format %12.5E. Thus, each Y-only record will be 12 characters wide (e.g. +1.23456E-01) and each X-Y record will be a maximum of 25 characters wide (e.g. +1.23456E-01<tab>-9.87654E+02). The maximum number of points for one channel is 110,000. There cannot be more than 10,000 data points prior to time zero nor more than 99,999 after time zero.

The name of the ASCII measurement data files should be the same given to the specification file described above (Entree for Windows file with extension .EV5) followed by a numeric file extension. The file extension should be the curve number of the curve contained in the file, padded on the left with zeroes to three characters, and should correspond to the curve number in the instrumentation record in the instrumentation specification group.

If the specification file is named TSTABC.EV5, and there are 35 measurement (curve) files, the measurement data files should be named TSTABC.001 through TSTABC.035.

Right:	TSTABC.001	TSTABC.012	TSTABC.101
Wrong:	TSTABC.T0	TSTABC.12	TSTABCDAT

Table 2-2 Measurement data filename examples

2.1.2.1 Signal Data Example (Y value only)

-.206786E-02
0.285321E-01
0.285321E-01
-.632679E-01
0.285321E-01
-.206786E-02
0.285321E-01
-.632679E-01
-.632679E-01
-.206786E-02
0.285321E-01
-.206786E-02
-.326679E-01
-.206786E-02
-.206786E-02
-.206786E-02
-.206786E-02
-.326679E-01
0.285321E-01

2.1.2.2 Signal Data Example (X and Y values)

-0.025000000	0.0
-0.024875002	0.0
-0.024750002	-0.12266
-0.024625001	0.12266
-0.024500001	0.0
-0.024375001	-0.24532
-0.024250000	0.0
-0.024125000	0.0
-0.024000000	-0.12266
-0.023875002	0.0
-0.023750002	0.0
-0.023625001	0.0
-0.023500001	0.12266
-0.023375000	0.0
-0.023250000	0.0
-0.023125000	-0.12266
-0.023000002	0.0
-0.022875002	0.0
-0.022750001	0.24532
-0.022625001	0.0
-0.022500000	0.0
-0.022375000	-0.12266
-0.022250000	-0.12266

2.2 General Test Information

The data elements defined below constitute the General Test Information group. The information includes the field order index, the variable name, (the application label associated with the variable), and a brief description of the data type and valid data range.

2.2.1.1 VERNO — Version Number

(Version Number) — Coded Value, 2 characters, pre-defined

The number of this version of the NHTSA Test Reference Guide is a pre-assigned code (C5). This code should be chosen for all component tests.

2.2.1.2 TITLE — Contract or Study Title

(Title) — Free Text, maximum length 70 characters

TITLE is the title of the contract or study.

2.2.1.3 TSTOBJ — Test Objectives

(Test Objectives) — Free Text, maximum length 70 characters

TSTOBJ is a description of the purpose of the test.

2.2.1.4 TSTDAT — Test Date

(Test Date) — Date

TSTDAT is the date the test was performed.

2.2.1.5 TSTPRF — Test Performer

(Test Performer) — Coded Value, 3 characters

TSTPRF is the code for the name of the organization performing the test.

2.2.1.6 CONNO — Contract Number

(Contract Number) — Free Text, maximum length 17 characters

CONNO is the Department of Transportation contract number assigned by the sponsoring organization.

2.2.1.7 TSTREF — Test Reference Number

(Test Reference Number) — Free Text, maximum length 10 characters

TSTREF is an alphanumeric code number assigned to the test by the test performer.

2.2.1.8 TSTTYP — Test Type

(Test Type) — Coded Value, 3 characters

TSTTYP indicates the type of test conducted, such as 216 for an FMVSS216 roof crush test.

2.2.1.9 TEMP — Ambient Temperature

(Ambient Temperature) — Bounded Integer, degrees Celsius, -99 to 99

TEMP is the temperature at the test location at the time of the test.

2.2.1.10 TOTCRV — Total Number of Curves

(Number of Curves) — Bounded Integer, -9,999 to 9,999

TOTCRV is the total number of recorded instrument channels (curves) in the test.

2.2.1.11 TSTCOM — Test Commentary

(Test Comments) — Free Text, maximum length 70 characters

TSTCOM is the field used to describe any peripheral test information, for which a coded field does not exist, including anomalies or problems. The reason for coding OTHER or NOT APPLICABLE in any of the coded fields in this group should be recorded in this field as well. If no comments are to be made, code the field NO COMMENTS (left justified).

2.3 Vehicle Information

The data elements defined below constitute the Vehicle Information group. The information includes the field order index, the variable name, (the application label associated with the variable), and a brief description of the data type and valid data range.

2.3.1.1 VEHNO — Test Vehicle Identification Number

(Test Vehicle Number) — Bounded Integer, 1 to 2

VEHNO is the reference number for a particular vehicle. This number should always be 1 unless there are components from more than one vehicle involved in the test.

2.3.1.2 MAKE — Vehicle Make

(Vehicle Make) — Coded Value, 4 characters

MAKE is the manufacturer of the vehicle; for instance, 01 represents a Chevrolet.

2.3.1.3 MODEL — Vehicle Model

(Vehicle Model) — Coded Value, 4 characters

MODEL is the model of the vehicle (e.g. a value of 06 represents an Impala.) A model code cannot be input unless MAKE has a valid input.

2.3.1.4 YEAR — Vehicle Model Year

(Vehicle Model Year) — Integer, 4 characters

YEAR is the model year of the vehicle.

2.3.1.5 NHTSANO — NHTSA Number

(NHTSA Number) — Coded Value, 6 characters

NHTSANO is the NHTSA test vehicle numbering system, a six-character alphanumeric identifier assigned to NHTSA-owned vehicles for the purpose of tracking them through purchase, testing and disposal. A pre-assigned NHTSA number accompanies all vehicles delivered for testing under NHTSA contract.

The first character is alphabetic; prior to 2001, the first two characters were alphabetic. The first character indicates the purchasing office:

- C – Compliance
- D – Defects
- M – Rulemaking
- R – NHTSA Research and Development
- T – TSP

The second character indicates the model year:

- D – H: 1983
- B: 1987
- J – N: 1988 – 1992
- P: 1993
- R – T: 1994 – 1996
- V – Y: 1997 – 2000
- 1 – 3: 2001 – 2003
- etc.

The last four characters constitute a manufacturer code, and vehicles purchased go into a sequential order by office.

Examples:

Code 5100: Toyota

Code MX5104B: Fourth Toyota tested by Rulemaking (NCAP) in 1999

2.3.1.6 BODY — Body Type

(Body Type) — Coded Value, 2 characters

BODY is the body type of the vehicle. A four-door sedan would be coded as 4S.

2.3.1.7 VIN — Manufacturer Vehicle Identification Number

(Manufacturer VIN) — Free Text, maximum length 20 characters

VIN is the identification number of the vehicle that has been assigned by the manufacturer.

2.3.1.8 CRTEST — Crash Tested Indicator

(Crash Tested Indicator) — Coded Value, 1 character

CRTEST is a marker to indicate whether or not the vehicle has been previously crash tested.

2.3.1.9 VEHCOM — Vehicle Commentary

(Vehicle Comments) — Free Text, maximum length 70 characters

VEHCOM is used to describe any special features of the vehicle. The reason for coding any of the coded fields in this group OTHER or NOT APPLICABLE should be recorded in this field as well. If no comments are to be made, enter NO COMMENTS in this field.

2.4 Component Information

The data elements defined below comprise the Component Information group. The information includes the field order index, the variable name, (the application label associated with the variable), and a brief description of the data type and valid data range.

2.4.1.1 VEHNO — Vehicle Number

(Test Vehicle Number) — Bounded Integer, 0 to 2

VEHNO is the reference number for a particular vehicle. This number should always be 1 unless there are components from more than one vehicle involved in the test. Code a zero (0) for non-vehicle components.

2.4.1.2 CMPNO — Component Number

(Component Number) — Bounded Integer, 1 to 99

CMPNO is the identifying number of the component being tested. The first such component shall be 1, the second 2, etc.

2.4.1.3 CMPNT — Component Tested

(Component Tested) — Coded Value, 4 characters

CMPNT is the specific component being tested.

2.4.1.4 CMPTYP — Component Type

(Component Type) — Coded Value, 2 characters

CMPTYP is the type of the component being tested.

2.4.1.5 CMPWGT — Component Weight

(Component Weight) — Bounded Real, kg, 0 to 9,999

CMPWGT is the weight of the component.

2.4.1.6 MODIND — Component Modification Indicator

(Modification Indicator) — Coded Value, 1 character

MODIND is a marker identifying whether or not the component has been previously modified.

2.4.1.7 MODDSC — Modification Description

(Modification Description) — Free Text, maximum length 70 characters

MODDSC is a description of any modifications to the component. This field applies to any type of component.

2.4.1.8 OCCTYP — Occupant Type

(Occupant Type) — Coded Value, 2 characters

OCCTYP is the type of dummy being tested.

2.4.1.9 DUMSIZ — Dummy Size Percentile

(Dummy Size Percentile) — Coded Value, 2 characters

DUMSIZ indicates the size of the dummy, measured either as a standard size percentile or by > age's classification for child dummies.

2.4.1.10 DUMMAN — Dummy Manufacturer

(Dummy Manufacturer) — Free Text; maximum length 70 characters

DUMMAN is the serial number as well as the manufacturer of the test dummy. The information should be entered as MFG: (manufacturer's name), S/N (dummy serial number). If the component tested was not a dummy part, leave this field blank.

2.4.1.11 CMPCOM — Component Commentary

(Component Comments) — Free Text, maximum length 70 characters

CMPCOM is a descriptive field containing any extraneous information needed to define the component. This field should explain any OTHER or N/A codes listed in required fields.

2.5 Test Configuration Information

The data elements defined below comprise the Test Configuration Information group. The information in this group completely describes the specific test being performed.

The information includes the field order index, the variable name, (the application label associated with the variable), and a brief description of the data type and valid data range.

2.5.1.1 VEHNO — Vehicle Number

(Test Vehicle Number) — Bounded Integer, 0 to 2

VEHNO is the reference number for a particular vehicle. This number should always be 1 unless there are components from more than one vehicle involved in the test. Code a zero (0) for non-vehicle components.

2.5.1.2 CMPNO — Component Number

(Component Number) — Bounded Integer, 1 to 99

CMPNO is the identifying number of the component being tested. The first such component shall be 1, the second 2, etc.

2.5.1.3 CNFNO — Configuration Number

(Configuration Number) — Bounded Integer, 1 to 999

CNFNO is the number identifying the specific test configuration for this component. The first such test configuration shall be 1, the second 2, etc.

2.5.1.4 TSTDEV — Test Device

(Test Device) — Coded Value, 3 characters

TSTDEV is the test device, such as a linear impactor, static loading device, etc.

2.5.1.5 DEVSPD — Test Device Speed

(Test Device Speed) — Bounded Real, km/h, 0.0001 to 99,999

DEVSPD is the speed of the test device at time zero.

2.5.1.6 DEVCOM — Test Device Commentary

(Test Device Comments) — Free Text, maximum length 70 characters

DEVCOM is a descriptive field for any extra information needed to define the test device. This field should explain any OTHER or NA codes listed in the TSTDEV field.

2.5.1.7 CONFIG — Test Configuration

(Test Configuration) — Coded Value, 3 characters

CONFIG is the specific test configuration, e.g. abdominal compression (static, coded ABD) or guided head-form dynamic impact (coded HDG for FMVSS 201 testing).

2.5.1.8 CMPSPD — Component Speed

(Component Speed) — Bounded Real, km/h, 0.0001 to 99,999

CMPSPD is the initial speed of the component at time zero.

2.5.1.9 CNTANG — Contact Angle

(Contact Angle) — Bounded Integer, degrees, 0 to 359

CNTANG is the angle of contact between the travel vector of the test device and the plane tangent to the component at the impact point. A perpendicular impact is defined as 0 degrees, which is also the reference line for the measurement. This field applies only to dynamic tests.

2.5.1.10 CNTLOC1 — Contact Location #1

(Contact Location # 1) — Bounded Integer, millimeters, 0 to 99,999

CNTLOC1 is the location on the component where contact occurred with the test device. It may also be the attachment location for the test device. CNTLOC1 is the vertical measurement taken from the top of the component to the test device contact point. If the component being tested is a vehicle roof pillar or a dummy component, such as an arm or leg, this measurement may be taken along the local axis of the component.

Table 2-3 lists examples of contact measurements. **Figure 2-2** shows the contact codes for various points on the dash-panel.

2.5.1.11 CNTLOC2 — Contact Location #2

(Contact Location # 2) — Bounded Integer, millimeters

CNTLOC2 is the location on the component where contact occurred with the test device. It may also be the attachment location for the test device. CNTLOC2 is the horizontal measurement taken from the left edge of the component being tested to the test device contact point. This field supplies additional location data when CNTLOC1 is not enough to uniquely define the contact point.

Table 2-3 lists examples of contact measurements. **Figure 2-2** shows the contact codes for various points on the dash-panel.

COMPONENT (CMPNT)	COMPONENT PLANE OR AXIS*	REFERENCE POINT FOR VERTICAL MEASUREMENT (CNTLOC1 – MM)	REFERENCE POINT FOR HORIZONTAL MEASUREMENT (CNTLOC2 - MM)
<i>Dash Panel</i> DP01 - DP09	Not applicable.	See Figure 2-2 . Enter 0.0	See Figure 2-2 . Enter 0.0
<i>Doors</i> DRLF DRLR DRRF DRRR DRSL DROT (rear door)	X-Z	Top of window frame or window downward to contact point.	Outside or rearmost edge of window frame, window or door, forward to contact point. Left edge of door, right to contact point
<i>Pillars</i> PLAL PLAR PLBL PLBR	Z	Top of pillar down longitudinal axis to contact point.	Not applicable.
HOOD	X-Y	Front edge of hood backward to contact point.	Left edge of hood, right to contact point.
<i>Seats</i> SEBK	Y-Z	Top edge of seatback downward to contact point.	Left edge of seatback, right to contact point.
SECU	X-Y	Front edge of seat cushion backward to contact point.	Left edge of seat cushion, right to contact point.
<i>Dummies</i> CHST	Y-Z	Top of chest or shoulder downward to contact point.	Left side of chest, right to contact point.
FEMR TIBA	Z	Top of component down longitudinal axis.	Not applicable.

Table 2-3 CNTLOC1 and CNTLOC2 Reference Points

* For structures such as the roof, doors and hood, the plane is approximately parallel to the surface of the component.

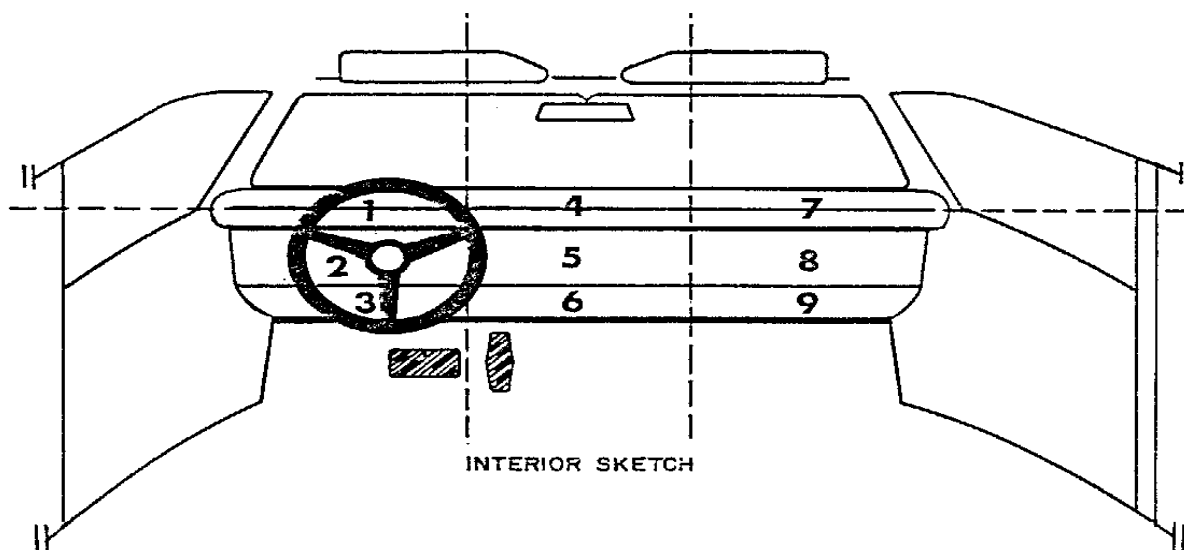


Figure 2-2 Reference Points for Contact Locations (CNTLOC1 / CNTLOC2)

2.5.1.12 CNTCOM — Contact Commentary

(Contact Comments) — Free Text, maximum length 70 characters

CNTCOM is a descriptive field for any extra information needed to explain the contact. It may be used to describe a reference location for CNTLOC1 and CNTLOC2.

2.5.1.13 CFNCOM — Configuration Commentary

(Configuration Comments) — Free Text, maximum length 70 characters

CFNCOM is a descriptive field for any extra information needed to define the test configuration. This field should explain any OTHER or N/A codes listed in the CONFIG field.

2.6 Instrumentation Information

The data elements defined below constitute the Instrumentation Information group.

Approximately twenty milliseconds of data prior to time zero should come with all measurement data; data shall meet the class 1000 specifications of the SAE J211 recommendation; and all data should be truncated at a common time value to avoid extending the pulse well past the period of significant activity.

The minimum sample rate shall be 10000 Hz. A sample rate should be chosen such that the DELT value does not have to be rounded off.

The information includes the field order index, the variable name, (the application label associated with the variable), and a brief description of the data type and valid data range.

2.6.1.1 VEHNO — Test Vehicle Identification Number

(Test Vehicle Number) — Bounded Integer, 0 to 2

VEHNO is the reference number for a particular vehicle. This number should always be 1 unless there are components from more than one vehicle involved in the test. Code a zero (0) for non-vehicle components.

2.6.1.2 CMPNO — Component Number

(Component Number) — Bounded Integer, 1 to 99

CMPNO is the identifying number of the component being tested. The first such component shall be 1, the second 2, etc.

2.6.1.3 CNFNO — Configuration Number

(Configuration Number) — Bounded Integer, 1 to 999

CNFNO is the number identifying the specific test configuration for this component. The first such test configuration shall be 1, the second 2, etc.

2.6.1.4 CURNO — Curve Number

(Curve Number) — Bounded Integer, 1 to 200

CURNO is the sequential number (1,2,3...) assigned to a specific sensor and data curve.

2.6.1.5 SENTYP — Sensor Type

(Sensor Type) — Coded Value, 2 characters

SENTYP indicates the type of sensor used for collecting the measurements at the time of the test, such as AC for accelerometer.

2.6.1.6 SENATT — Sensor Attachment

(Sensor Attachment) — Coded Value, 6 characters

SENATT is the actual physical attachment point of the sensor. The sensor may or may not be attached to the component being tested.

2.6.1.7 AXIS — Axis Direction of the Sensor

(Axis) — Coded Value, 2 characters

AXIS is the axis direction for sensors measuring vector quantities. Specific component axes are local and may be different for every component. Any ambiguous reference for a coordinate system should be explained in the INSCOM field.

AXIS is always applicable when the measurement is a vector quantity (acceleration, force, velocity, and so forth). Refer to *Appendix A: Data Coordinate System* for additional information.

2.6.1.8 XUNITS — Time Units or ‘Independent Axis’ Units

(X Units) — Coded Value, 3 characters

XUNITS indicates either the unit of time for time series sensor data (e.g. 'SEC'), or the units of the independent coordinate of a non-time series signal (e.g. If a load is applied in a controlled fashion to produce a deflection, the load is the independent coordinate, and the deflection is the dependent coordinate). *Table 2-4* lists admissible unit codes.

UNIT	DESCRIPTION	COMMENT
CEN	DEGREES CELSIUS	TEMPERATURE
DEC	DECIBELS	NOISE
DEG	DEGREES	ANGULAR DISPLACEMENT
DP2	DEGREES/SEC ²	ANGULAR ACCELERATION
DPS	DEGREES/SEC	ANGULAR VELOCITY
G'S	G'S	ACCELERATION
KPA	KILOPASCALS AB	PRESSURE - ABSOLUTE
KPG	KILOPASCALS GA	PRESSURE - GAUGE
KPH	KILOMETERS/HOUR	VELOCITY
MM	MILLIMETERS	DISPLACEMENT
MPM	MICROMET/MET	STRAIN
NON	DIMENSIONLESS	DIMENSIONLESS
NSC	NEWTON-SECONDS	IMPULSE
NWM	NEWTON-METERS	MOMENT
NWT	NEWTONS	FORCE
OTH	OTHER	OTHER
PST	PERCENT STRAIN	STRAIN
RMM	RECIPROCAL MM	CURVATURE
SEC	SECONDS	TIME
VOL	VOLTS	VOLTAGE

Table 2-4 XUNITS / YUNITS – Acceptable Values

2.6.1.9 YUNITS — Data Measurement Units

(Y Units) — Coded Value, 3 characters

YUNITS indicates the units used to measure the signal of the sensor data. **Table 2-4** lists admissible unit codes.

2.6.1.10 PREFIL — Pre-filter Frequency

(Pre-filter Frequency) — Bounded Integer, 0 to 99,999

PREFIL is the cutoff frequency in Hz of a low-pass filter (digital or analog) applied to the signal. This frequency is defined as where filter gain equals 70 percent (-3db.)

2.6.1.11 INSMAN — Manufacturer of the Instrument

(Instrument Manufacturer) — Free Text, maximum length 70 characters

INSMAN describes the manufacturer of the instrument. The model and serial number should also be included. The format for this field should be: MFG: manufacturer name, S/N: serial number.

2.6.1.12 CALDAT — Calibration Date

(Calibration Date) — Date

CALDAT is the most recent calibration date of the instrument.

2.6.1.13 INSRAT — Instrument Rating

(Instrument Rating) — Bounded Integer, - 999,999 to 999,999

INSRAT represents the manufacturer's maximum rated value for the transducer. This value is in the units that the transducer will measure (g's for an accelerometer.)

2.6.1.14 CHLMAX — Channel Maximum Rating

(Channel Maximum Rating) — Bounded Integer, 0 to 999

CHLMAX represents the full-scale value of the data based upon the actual test setup, including signal conditioning, as a percentage of INSRAT, and may exceed 100%. If the maximum signal that could be recorded was 100 g's (equal to INSRAT) and the peak value of the signal was 85 g's, then CHLMAX would be 85.

2.6.1.15 INIVEL — Initial Velocity

(Initial Velocity) — Bounded Real, kilometers per hour, - 200 to 200

INIVEL is the initial (time zero) velocity of the sensor along the axis of sensitivity. This field applies only to linear accelerometers.

2.6.1.16 NFP — Number of First Point

(First Point) — Bounded Integer, -10,000 to 0

NFP represents the index number of the first point in the data array (less than or equal to 0). Time zero always has an index number of 0. If no data exists prior to time zero, NFP is equal to 0; if 20 data points exist prior to time zero, NFP is equal to -20. There may never be more than 10,000 points before time zero.

2.6.1.17 NLP — Number of Last Point

(Last Point) — Bounded Integer, 0 to 99,999

NLP represents the index number of the last point in the data array. If 1,000 points were digitized, and NFP is equal to -100, then NLP is equal to 899. NLP can never be greater than 99,999.

2.6.1.18 DELT — Time Increment

(Time Step) — Bounded Integer, microseconds, 0 to 999,999

DELT is the time increment in microseconds between each data point. DELT is assumed to be constant for all data points for a given sensor (uniform sampling frequency).

2.6.1.19 DASTAT — Data Status

(Data Status) — Coded Value, 2 characters

DASTAT indicates the status of the data as it appears in the data submission. This field is used to indicate a signal which is invalid (code MN for meaningless), or which becomes questionable or invalid part of the way through a signal (code CF and explained in INSCOM). If a signal is computed, DASTAT is CM. An example of a computed signal would be the resultant acceleration from a tri-axial accelerometer in a chest form.

2.6.1.20 CHSTAT — Channel Status

(Channel Status) — Coded Value, 1 character

CHSTAT indicates whether the data channel is primary or redundant. If, for example, any component is instrumented with a backup instrumentation, the primary channels would be coded P and redundant channels should be labeled R.

2.6.1.21 INSCOM — Instrumentation Commentary

(Instrumentation Comments) — Free Text, maximum length 70 characters

INSCOM is any further commentary on the instrumentation data, including any unusual conditions affecting the data or a reference to a document that describes problems with a particular curve. The reasons for coding any of the coded fields in this group OTHER or NOT APPLICABLE should be recorded in this field as well. If no comments are to be made, enter NO COMMENTS.

Chapter 3 : Test Report Format

A written report should be generated for each test to be submitted. This report shall be saved on the submission physical media under the directory:

\REPORT\

with the filename

R<TSTREF>.pdf

where <TSTREF> has the same value as TSTREF in **Section 2.2 General Test Information** of this guide.

The report shall preferably be in the Adobe PDF document format (www.adobe.com). Alternatively, a report may be submitted in Microsoft Word 97 or Microsoft Word 2000 format if the test site is unable to generate a PDF file.

At a minimum, each report shall contain the following information:

- 1) A cover page including,
 - Title of Study
 - Test Performer
 - Test Reference Number (EV5 specification file - field TSTREF)
 - Contract Number
 - Test Date
- 2) In the main body of the test report, the following items shall be included:
 - A text description and diagram/pictures of the test setup.
 - Description of camera views and type of media (film/video).
 - Information which could not be included in the EV5 specification file, and that the test engineer and/or COTR deem appropriate or important to mention.
- 3) In the report Appendix A, the following information shall be included
 - A diagram describing the coordinate system.
 - A table describing load cell manipulations for positive values.
- 4) In the report Appendix B, a plot of each curve submitted exactly as it should appear in the database. The plots will be compared with the signal data loaded into the database to ensure that

the signals the test laboratory intends to enter into the NHTSA database are not corrupted during the submission and loading process. Each plot should display the maximum and minimum values of the signal and their respective event times.

- 5) In the report Appendix C, a list of the instrumentation associated with each channel, including transducer, sampling rate, signal conditioning, units and axis.

The COTR or test engineer is encouraged to include any other information that they feel is necessary to make the report meaningful. However, the COTR or test engineer may not eliminate any of five (5) minimum requirements outlined above.

Chapter 4 : Pre- and Post-Event Images

Images and video captured before and after the test may be submitted whether they are digital images or processed film images.

4.1 Digital Images

Digital images and videos of the test before and after the event shall be submitted on the submission media as noted in **Chapter 1 : Media Format and Layout**. Video files shall be submitted under the directory \PREPOST\VIDEOS. Still images shall be submitted under the directory \PREPOST\PHOTOS. File names should be descriptive. Naming convention is at the discretion of the COTR, with the exception that standard file extensions shall be applied to all files as appropriate to the content type of each file.

As an example, TIFF format image files should be named with a file extension of

.tif

while JPEG format image files should be named with a file extension of

.jpg

Digital images shall be submitted in one of the following formats: Windows bitmap (BMP), GIF, TIFF, or JPEG.

4.2 Processed Film Images

Hardcopy processed film images shall be included as an appendix in the report.

If you have data that you wish to submit but which is not specified in this guide, please send email to barbara.hennessey@nhtsa.dot.gov.

Chapter 5 : Event Images, Film, and Video

The procedures for the capturing and formatting of images of the impact event are described below. Procedures for images captured by high-speed film and high-speed video are outlined below, as well as generic procedures for other event image types.

5.1 High-Speed Film

NOTE: This section describes procedures for capturing and submitting high-speed film, not digital video. Refer to **Section 5.2 High-Speed Digital Video**, below, for high-speed video requirements.

5.1-1 Film Image Content

The only content requirements of the high-speed film camera image view specified in this guide are:

- 1) Somewhere in the image view there should be text denoting the TSTREF field from the EV5 specification file as described in Chapter 2.
- 2) Some type of visible time mark should be present to indicate time zero for the test. This time zero should correspond with the time zero on the data acquisition system.
- 3) Somewhere within the image, the time at which the image was captured shall also be displayed. Alternatively, the use of the LED timing mark available on most high-speed cameras is acceptable.

5.1.1.1 Media Format

Processed film should be submitted to NHTSA with the test submission. Multiple camera angles may be submitted on a single reel, or multiple reels may be submitted.

5.2 High-Speed Digital Video

NOTE: This section describes procedures for capturing and submitting high-speed digital video, not film.

5.2-1 Video Image Content

The only content requirements of the high-speed video camera image view specified in this guide are:

- 1) Somewhere in the image view there should be text denoting the TSTREF field from the EV5 specification file as described in Chapter 2.
- 2) Some type of visible time mark should be present to indicate time zero for the test. This time zero should correspond with the time zero on the data acquisition system.
- 3) Somewhere within the image, the time at which the image was captured shall also be displayed.

5.2-2 High-Speed Digital Video Information File

The High-Speed Video Information File contains information about the data from each camera used in the test. The file is a delimited text file similar to the EV5 specification file (**Section 2.1-1 Specification Data**) containing the fields listed below. Values for TSTREF, VSCFACTOR, DESC, and COMMENT shall be written to an ASCII text file on single line, each field separated by a pipe ('|') delimiter, in the order listed above. The line shall be terminated by a carriage return. Each line constitutes a single record, and records should be included in the High Speed Video information file for each camera sequence submitted. All entries shall be in uppercase. The High Speed Video Information File shall be named <TSTREF>.HS5.

5.2.2.1 CAMNO — Camera Number

(Camera Number) — Bounded Integer, 0 to 99

5.2.2.2 TSTREF — Test Reference Number

(Test Reference Number) — Free Text, maximum length 10 characters

This should be the same as the TSTREF in the EV5 specification file.

5.2.2.3 VSCFACTOR — Video Frame Number Scale Factor

(Conversion Factor to Scale Video Frame Number) — Real, ≥ 0

This is the scale factor to be applied against the integer frame number of a sequential image file, as described below, in order to convert the integer frame sequence value into a time value in seconds. A value of zero (0) may be entered if sequential frames are not stored at constant intervals of time as with force-deflection data.

5.2.2.4 DESC — View Description

(Camera View Description) — Free Text, maximum length 70 characters

A description of the view of this high-speed video camera (example ‘front left view’, or ‘overhead view’)

5.2.2.5 COMMENT — Camera Commentary

(Camera Commentary) — Free Text, maximum length 70 characters

Comment on this particular camera view.

5.2-3 Sequential Image and Movie Submission Format

High-speed video data should be submitted in two formats, sequential raster image files and AVI movies.

5.2.3.1 Sequential Bitmap Image Files

Most high-speed video systems output sequential raster image files, with the frame number denoted within the filename of each file. Each file shall be numbered using the following file naming convention:

F<frame number>.<file format extension>

where

<frame number> is the integer sequential frame number of each image. A minus (-) should prefix the <frame number> for images captured before the start of the event.

<file format extension> is TIF for TIFF format image files, JPG for JPEG format image files, GIF for GIF format image files, and BMP for Windows bitmap files.

5.2.3.2 AVI Files

For each camera view, AVI movie files shall be generated using a widely available codec agreed upon by the laboratory and the COTR. For help with codec selection, send email to nrd.softdev@nhtsa.dot.gov. Each AVI file shall use the following naming convention:

<TSTREF> C <CAMNO>.avi (no spaces in filename)

5.2-4 Media Format

All high-speed video files shall be stored in the directory \EVENT as described in *Chapter 1 : Media Format and Layout* of this guide.

The High-Speed Video Information File <TSTREF>.HS5 shall be stored in the directory \EVENT\HSVIDEO on the test submission media with the filename

High-speed video sequential raster image files and AVI movies shall be placed on the test submission media under \EVENT \HSVIDEO\CAMERA<CAMNO>\, where <CAMNO> is a sequential number assigned to each camera, further described in the HIGH-SPEED VIDEO INFORMATION FILE section above.

Example:

Test lab ABC conducted test T1234 that had 3 high-speed video cameras collecting images, each having views of an impact event from the top, right side, and front. Each camera captured TIFF images from -40 to +500 milliseconds in increments of one millisecond. The digital test submission media would have the following directories:

\EVENT\HSVIDEO\CAMERA1\
\EVENT\HSVIDEO\CAMERA2\
\EVENT\HSVIDEO\CAMERA3\

The following files would be included (**example only**):

\EVENT\HSVIDEO\T1234.HS5	(High Speed Video Information File)
\EVENT\HSVIDEO\CAMERA1\T1234C1.AVI	(AVI Movie File)
\EVENT\HSVIDEO\CAMERA1\F-40.TIF	(Sequential Bitmap Image File)
...	
\EVENT\HSVIDEO\CAMERA1\F0.TIF	(Sequential Bitmap Image File)
...	
\EVENT\HSVIDEO\CAMERA1\F500.TIF	(Sequential Bitmap Image File)
\EVENT\HSVIDEO\CAMERA2\T1234C2.AVI	
\EVENT\HSVIDEO\CAMERA2\F-40.TIF	

...
\EVENT\HSVIDEO\CAMERA2\F0.TIF
...
\EVENT\HSVIDEO\CAMERA2\F500.TIF
\EVENT\HSVIDEO\CAMERA3\T1234C2.AVI
\EVENT\HSVIDEO\CAMERA3\F-40.TIF
...
\EVENT\HSVIDEO\CAMERA3\F0.TIF
...
\EVENT\HSVIDEO\CAMERA3\F500.TIF

The contents of the High Speed Video information file named T1234.HS5 would be:

1|T1234|MILLISECONDS|TOP VIEW|NO COMMENTS
2|T1234|MILLISECONDS|RIGHT SIDE VIEW|NO COMMENTS
3|T1234|MILLISECONDS|FRONT VIEW|NO COMMENTS

5.3 Other Event Images

Other event images, such as BETA or VHS tapes, can be included in the test submission packet. Please send email to barbara.hennessey@nhtsa.dot.gov if you have any questions about submitting event images not specified in this guide.

Appendix A: Data Coordinate System

Starting with Version 4 of the NHTSA Test Reference Guides, all submissions will conform to SAE J211/1 MAR95 Instrumentation for Impact Test. Please refer to SAE J211 for a complete description of the coordinate system and signal polarities for vehicle occupants.

A-1. Using the Coordinate System Correctly

The rules for determining the sign conventions described below will enable anyone involved in NHTSA-sponsored testing to determine the proper sign and coordinate axis for any measured quantity.

All coordinate systems are orthogonal, three-dimensional, and right handed. The global coordinate systems for the vehicle and the test occupants are shown in **Figure A-1** and **Figure A-2**. The coordinate system for the nine-accelerometer head array is shown in **Figure A-3**, along with the proper SENATT codes. **Table A-1** lists the polarity of the sensor output from various dummy manipulations when using this coordinate system.

A-2. Vehicle Global Coordinate System

- X is positive forward
- Y is positive right (toward the passenger side door)
- Z is positive down

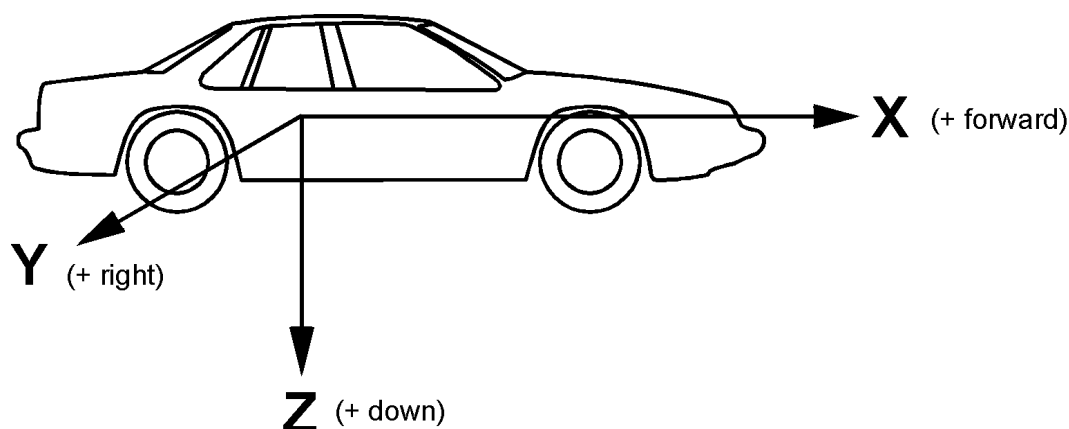


Figure A-1 Vehicle Global Coordinate System

A-3. Occupant Global Coordinate System

- X is positive forward (posterior to anterior)
- Y is positive right
- Z is positive down

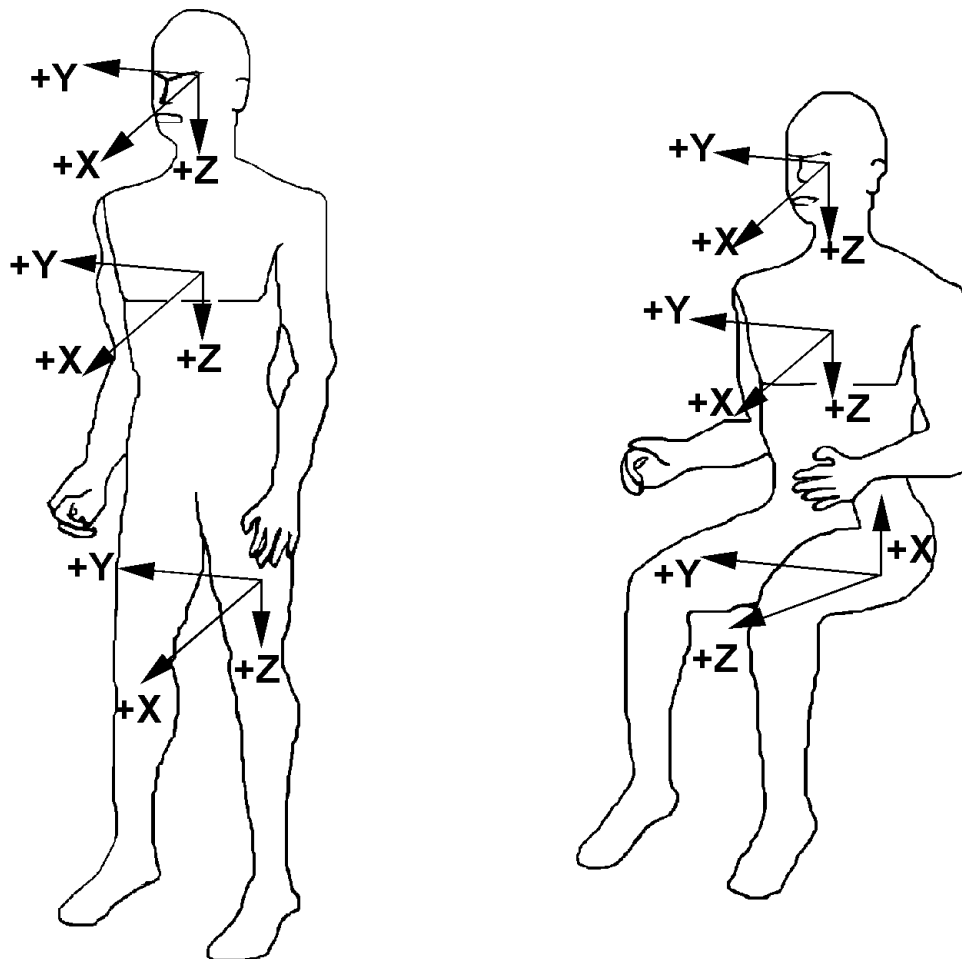


Figure A-2 Occupant Global Coordinate System

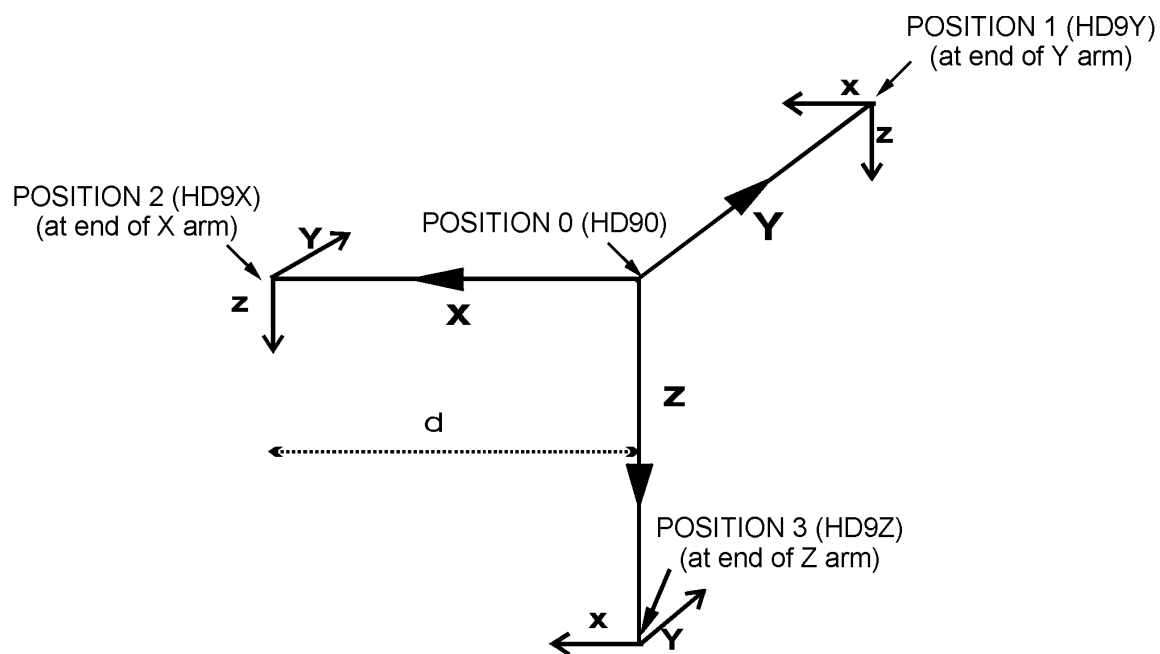


Figure A-3 Nine-Accelerometer Coordinate System

Table A- 1 Dummy Manipulations for Checking Recorded Load Cell Polarity Relative to Sign Convention

Load Cell	Measure	Dummy Manipulations	Polarity
Upper and lower neck loads	Fx	Head rearward, chest forward	+
	Fy	Head leftward, chest rightward	+
	Fz	Head upward, chest downward	+
	Mx	Left ear toward left shoulder	+
	My	Chin toward sternum	+
	Mz	Chin toward left shoulder	+
Left shoulder loads (BIOSID)	Fx	Left shoulder forward, chest rearward	+
	Fy	Left shoulder rightward, chest leftward	+
	Fz	Left shoulder downward, chest upward	+
Right shoulder loads (BIOSID)	Fx	Right shoulder forward, chest rearward	+
	Fy	Right shoulder rightward, chest leftward	+
	Fz	Right shoulder downward, chest upward	+
Clavicle loads	Fx	Shoulder forward, chest rearward	+
	Fz	Shoulder downward, chest rearward	+
Upper and lower lumbar spine	Fx	Chest rearward, Pelvis forward	+
	Fy	Chest leftward, pelvis rightward	+
	Fz	Chest upward, pelvis downward	+
	Mx	Left shoulder toward left hip	+
	My	Sternum toward front of legs	+
	Mz	Right shoulder forward, left shoulder rearward	+
Sacrum load (BIOSID)	Fy	Left H-point pad leftward, chest rightward	+
Left iliac load (BIOSID)	Fy	Left iliac rightward, chest leftward	+
Right iliac load (BIOSID)	Fy	Right iliac rightward, chest leftward	+
Pubic load (side impact)	Fy	Right H-point pad leftward, left pad rightward	(-)
Crotch belt loads	Fx	Pubic rearward, pelvis forward	(-)
	Fz	Pubic upward, chest downward	(-)
Iliac lap belt loads	Fx	Upper iliac spine rearward, chest forward	(-)
	My	Upper iliac spine rearward, chest forward	+
Left side abdominal load (Eurosid-1)	Fy	Left side of abdomen rightward, chest leftward	+
Right side abdominal load (Eurosid-1)	Fy	Right side of abdomen leftward, chest rightward	(-)
Femur loads	Fx	Knee upward, upper femur downward	+

Load Cell	Measure	Dummy Manipulations	Polarity
(dummy in seated position, femurs horizontal)	Fy	Knee rightward, upper femur leftward	+
	Fz	Knee forward, pelvis rearward	+
	Mx	Knee leftward, hold upper femur in place	+
	My	Knee upward, hold upper femur in place	+
	Mz	Tibia leftward, hold pelvis in place	+
Knee clevis	Fz	Tibia downward, femur upward	+
Upper tibia loads	Fz	Tibia downward, femur upward	+
	Mx	Ankle leftward, hold knee in place	+
	My	Ankle forward, bottom of knee clevis rearward	+
Lower tibia loads	Fx	Ankle forward, knee rearward	+
	Fy	Ankle rightward, knee leftward	+
	Mx	Ankle leftward, hold knee in place	+
	My	Ankle forward, bottom of knee clevis rearward	+

Appendix B: Codes

A comprehensive reference for currently acceptable codes for a given coded value may be obtained from the Entrée for Windows program, described briefly in **Section 1.2-1 Entrée for Windows**, or from the NHTSA Research and Development web site where the very latest updates are available as part of our database publication.

Any use of the code “OTHER” should be explained in an appropriate commentary field.

VERNO

The special VERNO field is used to identify the version of the reference guide used to code and prepare the content of the data set. It does not refer to the format of the files within the data set.

Example:

It is possible to convert an existing Component data set from the version 3 format, having GR files, into an EV5 format data set. Since the original data set was developed using the version 3 Test Reference Guide VERNO would then have a value of “C3”.

CODE	DESCRIPTION
C5	Data prepared according to the version 5 guide.
C4	Data prepared according to the version 4 guide.
C3	Data prepared according to the version 3 guide.
C2	Data prepared according to the version 2 guide.

Appendix C: Technical Support Information

C-1. Reference Guide Updates and Software Updates

NHTSA now maintains web sites for the NHTSA Test Reference Guides and the Entree for Windows software. The latest versions of the guides and the software are made available for download from the sites below:

NHTSA Test Reference Guides

<http://www-nrd.nhtsa.dot.gov/software/test-reference-guides/test-reference-guides.html>

Entree for Windows

<http://www-nrd.nhtsa.dot.gov/software/entree/index.htm>

Because the NHTSA Research and Development web site is a constantly evolving resource it may happen that the links noted above do not work correctly. In the event that this does occur please utilize the available **SEARCH** feature to search for “NHTSA Test Reference Guides” and “Entrée for Windows”.

C-2. Requesting Assistance

In the event that a user of the Test Reference Guides requires technical support with using the guides, or has questions about the content of the guides, support is offered via Internet e-mail. Simply send a message to the address

nrd.softdev@nhtsa.dot.gov

with a subject line including the text

ATTN: NHTSA Test Reference Guides

To request assistance with the Entree for Windows software send an e-mail to

nrd.softdev@nhtsa.dot.gov

with a subject line including the text

ATTN: Entrée for Windows

A staff person will acknowledge the request, and we will endeavor to provide a complete response within two (2) business days on a first-come, first-served basis.

C-3. Reporting a Problem

To report a problem or potential bug in either the guides or the Entrée for Windows software, please send an e-mail to

nrd.softdev@nhtsa.dot.gov

with a subject line including the text

BUG REPORT: NHTSA Test Reference Guides

or

BUG REPORT: Entrée for Windows

for the Test Reference Guides, or Entrée for Windows, respectively.

A staff person will acknowledge the problem report. For simple problems we will endeavor to provide a complete response within five (5) business days on a first-come, first-served basis. In the event that correction of a problem requires more than 5 business days we will notify the user in advance.